

CLAIMS

- 1 1. A method for spatially modulating radiation comprising:
2 directing at least one radiation beam upon at least one surface acoustic wave diffractive
3 element;
4 and driving at least one of said surface acoustic diffractive elements with a plurality of
5 modulating signals to generate a plurality of independently modulated output radiation beams
6 having parameters.
- 1 2. The method of claim 1 wherein the modulating signals are electrical.
- 1 3. The method of claim 1 wherein the driving comprises modulating at least one output
2 radiation beam parameter selected from the group consisting of the direction, the
3 amplitude, phase, and frequency of the modulated output radiation beams.
- 1 4. The method of claim 2 wherein the driving comprises applying a plurality of separate
2 modulating signals for each surface acoustic wave diffractive element.
- 1 5. The method of claim 4 wherein at least one of the modulating signals is characterized by
2 a plurality of frequencies.
- 1 6. The method of claim 1 wherein the radiation beam directing is with a laser.
- 1 7. The method of claim 1 wherein the radiation beam directing is with a pulsed radiation
2 beam.
- 1 8. The method of claim 7 including timing the pulse of radiation to diffract from a surface
2 acoustic wave diffractive element after a predetermined diffractive pattern has propagated
3 to a predetermined location.
- 1 9. The method of claim 1 and further comprising directing the modulated output radiation
2 beams upon photosensitive material.
- 1 10. Apparatus for spatially modulating radiation comprising:

1 10. Apparatus for spatially modulating radiation comprising:
2 at least one surface acoustic wave diffractive element, each element having a surface,
3 at least one transducer of surface acoustic waves,
4 a source of a plurality of modulating signals driving the at least one transducer to
5 transduce a surface acoustic wave in the surface of at least one of said surface acoustic
6 wave diffractive elements,
7 a source of at least one input radiation beam constructed and arranged so that at least a
8 portion of the input radiation beam strikes a surface acoustic wave diffractive element
9 from outside the surface of that surface acoustic wave diffractive element,
10 and a plurality of modulated output radiation beams modulated by respective ones of said
11 modulating signals.

1 11. The apparatus of claim 10 wherein the source of radiation is a laser having a cavity.

1 12. The apparatus of claim 11 wherein the surface acoustic wave diffractive elements are
2 positioned inside the laser cavity so as to direct the output radiation beams out of the laser
3 cavity.

1 13. The apparatus of claim 12 further comprising an optical beam director system in optical
2 communication with the at least one surface acoustic wave diffraction element, which
3 optical beam director system is constructed and arranged to direct the input radiation
4 beam into the laser cavity and the modulated radiation beams out of the laser cavity.

1 14. The apparatus of claim 10 wherein said at least one surface acoustic wave diffractive
2 element has an active area.

1 15. The apparatus of claim 14 wherein the active area is a piezoelectric.

1 16. The apparatus of claim 14 wherein said active area has a reflectivity greater than zero.

1 17. The apparatus of claim 14 wherein said active area has a transmissivity greater than zero.

1 18. The apparatus of claim 14 wherein the active area is patterned.

1 19. The apparatus of claim 14 wherein said active area is on a curved surface.

1 20. The apparatus of claim 14 wherein said active area comprises multiple regions with
2 different material.

1 21. The apparatus of claim 14 wherein the transducer comprises interdigital electrodes
2 deposited on top of a piezoelectric substrate.

1 22. The apparatus of claim 21 wherein the interdigital electrodes are regularly spaced.

1 23. The apparatus of claim 21 wherein the interdigital electrodes are irregularly spaced.

1 24. The apparatus of claim 10 wherein the at least one surface acoustic wave diffractive
2 element includes at least one transducer to create surface acoustic waves in a plurality of
3 adjacent active areas, the plurality of adjacent active areas being situated so as to receive
4 portions of the source of beam of radiation and wherein the transducer is used to generate
5 surface acoustic waves in the plurality of active areas.

1 25. The apparatus of claim 24 wherein the at least one transducer responds to at least one
2 frequency of the modulating signals.

1 26. The apparatus of claim 14 and further comprising a second transducer,
2 the at least one transducer being electrically connected to said second transducer.

1 27. The apparatus of claim 14 and further comprising at least one second transducer
2 constructed and arranged to transduce acoustic energy into electrical energy.

1 28. The apparatus of claim 14 and further comprising a second surface acoustic wave
2 diffractive element wherein the at least one surface acoustic wave diffractive element is
3 located on the same substrate as the second surface acoustic wave diffractive element.

1 29. The apparatus of claim 28 wherein the at least a first surface acoustic wave diffractive
2 element is separated from the at least a second surface acoustic wave diffractive element
3 by gaps in the substrate.

1 30. The apparatus of claim 10 wherein the source of modulating signals provides radio
2 frequency electrical signals.